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PATENT

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LU et al.

Serial No.: 09/758,939

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Title: METHOD FOR PRODUCING A TRANSDUCER SLIDER WITH TAPERED EDGES

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

This is a preliminary amendment to the patent application identified above. Please enter the following amendments to the claims.

AMENDMENTS

IN THE CLAIMS:

Please amend claims 1-4, 14-16, 22, 34, 35, 39 and 40 as follows:

1. (Amended) A method for producing a transducer slider, comprising [the steps of]:

(a) coating a substrate with a radiation-sensitive layer;

(b) imagewise exposing the radiation-sensitive layer to radiation according to an intensity pattern;

(c) developing the image into the radiation-sensitive layer; and

(d) transferring the image into the substrate to form a transducer slider having a surface profile comprising a tapered edge.

2. (Amended) The method of claim 1, wherein [step (a) comprises spin coating a] the radiation-sensitive composition is spin coated on the substrate.

3. (Amended) The method of claim 2, [further comprising, after step (a) and before step (b), (a') applying] wherein heat is applied to the radiation-sensitive layer after (a) and before (b).

4. (Amended) The method of claim 3, wherein [step (a')] the application of heat results in solvent evaporation from the radiation-sensitive layer.

14. (Amended) The method of claim 1, [further comprising, after step (b) and before step (c), (b')] wherein [applying] a solvent is applied to the radiation-sensitive layer after (b) and before (c).

15. (Amended) The method of claim 14, wherein the image is developed into the exposed portion of the radiation-sensitive layer by the solvent [develops the exposed portion of the radiation-sensitive layer in step] during (c).

16. (Amended) The method of claim 1, wherein [step (c) comprises exposing] the substrate is exposed to an etchant during (c).

22. (Amended) The method of claim 1, wherein [step (d) further comprises] simultaneous removal of the patterned layer is carried out during (d).

34. (Amended) A method for producing a plurality of transducer sliders, comprising [the steps of]:

(a) coating a substrate with a photosensitive layer;

(b) exposing the photosensitive layer to curing radiation according to a patterned grayscale mask to convert the photosensitive layer into a patterned layer having a tapered edge;

(c) removing material from the substrate according to the patterned layer to form a surface profile comprising a tapered edge that corresponds to the tapered edge of the patterned layer; and

(d) sectioning the substrate into a plurality of transducer sliders.

35. (Amended) The method of claim 34, [further comprising, before step (a), assembling] wherein the substrate is assembled from a plurality of components before (a) that [after step (d)] will represent the plurality of transducer sliders after (d).

39. (Amended) The method of claim 35, [further comprising, before step (a), (e) cutting a] wherein a monolithic solid member is cut into the plurality of components before (a).

40. (Amended) A method for producing a transducer slider, comprising [the steps of]:

(a) coating a substrate with a radiation-sensitive layer;

(b) imagewise exposing the radiation-sensitive layer to radiation according to an intensity pattern;

(c) developing the image into the radiation-sensitive layer; and

(d) transferring the image into the substrate to form a transducer slider having a surface profile comprising a rounded corner.

REMARKS

No claims have been added or deleted by way of this amendment. Thus, upon entry of this preliminary amendment, claims 1-40 are pending. For the Examiner's convenience, the pending claims upon entry of this amendment are reproduced in Appendix A.

Claims 1-4, 14-16, 22, 34, 35, 39, and 40 have been amended to eliminate any ambiguity as to whether the claims are intended to recite step-plus-function limitations; such limitations are not intended. It should be evident that such rewording merely eliminates ambiguity, clarifies the

inventive subject matter, and does not introduce new matter. Thus, entry of the amendments is proper and requested.

The Examiner is welcome to contact the undersigned attorney at (650) 851-8501, if there are any questions concerning this communication.

Respectfully submitted,

Date: 2/15/2001 By: _____

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APPENDIX A

PENDING CLAIMS UPON ENTRY OF AMENDMENT

1. A method for producing a transducer slider, comprising:
(a) coating a substrate with a radiation-sensitive layer;
(b) imagewise exposing the radiation-sensitive layer to radiation according to an intensity pattern;
(c) developing the image into the radiation-sensitive layer; and
(d) transferring the image into the substrate to form a transducer slider having a surface profile comprising a tapered edge.

2. The method of claim 1, wherein the radiation-sensitive composition is spin coated on the substrate.

3. The method of claim 2, wherein heat is applied to the radiation-sensitive layer after (a) and before (b).

4. The method of claim 3, wherein the application of heat results in solvent evaporation from the radiation-sensitive layer.

5. The method of claim 1, wherein the radiation-sensitive layer is a positive resist.

6. The method of claim 1, wherein the radiation-sensitive layer is a low contrast resist.

7. The method of claim 1, wherein the radiation-sensitive layer has a thickness of about 1 to about 20 μm.

8. The method of claim 7, wherein the radiation-sensitive layer has a thickness of about 2 to about 10 μm.

9. The method of claim 1 wherein the radiation is photonic

10. The method of claim 1, wherein the radiation has a ultraviolet wavelength.

11. The method of claim 1, wherein the intensity pattern is provided using a grayscale mask.

12. The method of claim 11, wherein the patterned grayscale mask is electron-beam sensitive.

13. The method of claim 12, wherein the tapered edge corresponds to a portion of the patterned gray scale mask that has not been exposed to an electron beam.

14. The method of claim 1, wherein solvent is applied to the radiation-sensitive layer

after (b) and before (c).

15. The method of claim 14, wherein the image is developed into the exposed portion of the radiation-sensitive layer by the solvent during (c).

16. The method of claim 1, wherein the substrate is exposed to an etchant during (c).

17. The method of claim 16, wherein the etchant comprises a gas.

18. The method of claim 17, wherein the gas comprises plasma.

19. The method of claim 18, wherein the plasma is argon based.

20. The method of claim 16, wherein the etchant comprises a liquid.

21. The method of claim 15, wherein the etchant is an isotropic etchant.

22. The method of claim 1, wherein simultaneous removal of the patterned layer is carried out during (d).

23. The method of claim 1, wherein the substrate comprises a ceramic material.

24. The method of claim 23, wherein the ceramic material comprises a carbide.

25. The method of claim 24, wherein the carbide is selected from the group consisting of aluminum carbide, silicon carbide, titanium carbide, boron carbide, geranium carbide, tungsten carbide, and mixed-metal carbide.

26. The method of claim 23, wherein the ceramic material comprises a nitride.

27. The method of claim 23, wherein the ceramic material comprises an oxide.

28. A structure for forming a transducer slider, comprising a substrate and a patterned layer thereon having a tapered edge, wherein the patterned layer corresponds to a predetermined transducer slider surface profile.

29. The structure of claim 28, wherein the patterned layer is polymeric.

30. The structure of claim 29, wherein the patterned layer comprises substantially unexposed resist.

31. The structure of claim 28, wherein the predetermined transducer slider surface profile contains no exposed sharp edge.

32. The structure of claim 28, wherein the predetermined transducer slider surface profile

contains two portions that intersect at an angle of about 0.5 to about 10 degrees.

33. The structure of claim 32, wherein the angle from about 1 to about 5 degrees.

34. A method for producing a plurality of transducer sliders, comprising:
(a) coating a substrate with a photosensitive layer;
(b) exposing the photosensitive layer to curing radiation according to a patterned grayscale mask to convert the photosensitive layer into a patterned layer having a tapered edge;
(c) removing material from the substrate according to the patterned layer to form a surface profile comprising a tapered edge that corresponds to the tapered edge of the patterned layer; and
(d) sectioning the substrate into a plurality of transducer sliders.

35. The method of claim 34, wherein the substrate is assembled from a plurality of components before (a) that will represent the plurality of transducer sliders after (d).

36. The method of claim 35, wherein the plurality of components are substantially identical.

37. The method of claim 36, wherein the plurality of components are assembled in an array.

38. The method of claim 37, wherein the array is rectilinear.

39. The method of claim 35, wherein a monolithic solid member is cut into the plurality of components before (a).

40. A method for producing a transducer slider, comprising:
(a) coating a substrate with a radiation-sensitive layer;
(b) imagewise exposing the radiation-sensitive layer to radiation according to an intensity pattern;
(c) developing the image into the radiation-sensitive layer; and
(d) transferring the image into the substrate to form a transducer slider having a surface profile comprising a rounded corner.